

WHAT IS CLAIMED IS:

1. A ball electrode forming method comprising:

preparing a semiconductor apparatus having semiconductor devices
and a plurality of electrode pads electrically connected to the semiconductor
5 devices;

arranging a mask having an upper surface and a lower surface, a
plurality of openings extended from the upper surface to the lower surface, an area
of each of the openings in the lower surface being larger than an area of the
openings in the upper surface, on a surface of the semiconductor apparatus
10 having the electrode pads formed thereon so that the surface and the lower
surface can face each other;

arranging solder balls on the electrode pads arranged in the openings
from the upper surface side of the mask; and

electrically connecting the solder balls to the electrode pads to form ball
15 electrodes.

2. The ball electrode forming method according to claim 1, further
comprising:

applying fluxes on the electrode pads before the step of arranging the
20 mask.

3. The ball electrode forming method according to claim 1,

wherein each of the openings has a first side face extended from the
upper surface to the lower surface, and an angle between the first side face and
the upper surface is smaller than an angle between the first side face and the
25 lower surface.

4. The ball electrode forming method according to claim 3,
wherein the angle between the first side face and the upper surface is
roughly 60° or lower.

5 5. The ball electrode forming method according to claim 1,
wherein each of the openings has a second side face extended from
the upper surface to the lower surface, and an angle between the second side
face and the upper surface is roughly vertical.

10 6. The ball electrode forming method according to claim 5,
wherein a height of the second side face forming the roughly vertical
angle with the upper surface is roughly equal to or higher than a radius of each of
the solder balls.

15 7. The ball electrode forming method according to claim 1,
wherein the plurality of adjacent openings are interconnected in the
lower surface side.

20 8. A ball electrode forming method comprising:
peeling off a semiconductor apparatus from a wiring board, the
semiconductor apparatus having semiconductor devices and a plurality of
electrode pads electrically connected to the semiconductor devices, and being
mounted on the wiring board by a plurality of first ball electrodes formed on the
plurality of electrode pads;

25 after the peeling step, arranging a mask having an upper surface and a
lower surface, a plurality of openings extended from the upper surface to the lower
surface, an area of each of the openings in the lower surface being larger than an

area of the openings in the upper surface, on a surface of the semiconductor apparatus having the electrode pads formed thereon so that the surface and the lower surface can face each other;

arranging solder balls on the electrode pads arranged in the openings
5 from the upper surface side of the mask; and

electrically connecting the solder balls to the electrode pads to form
second ball electrodes on the electrode pads where the first ball electrodes have
been formed.

10 9. The ball electrode forming method according to claim 8, further
comprising:

applying fluxes on the electrode pads before the step of arranging the
mask.

15 10. The ball electrode forming method according to claim 8,
wherein each of the openings has a first side face extended from the
upper surface to the lower surface, and an angle between the first side face and
the upper surface is smaller than an angle between the first side face and the
lower surface.

20 11. The ball electrode forming method according to claim 10,
wherein the angle between the first side face and the upper surface is
roughly 60° or lower.

25 12. The ball electrode forming method according to claim 8,
wherein each of the openings has a second side face extended from
the upper surface to the lower surface, and an angle between the second side

face and the upper surface is roughly vertical.

13. The ball electrode forming method according to claim 12,
wherein a height of the second side face forming the roughly vertical
5 angle with the upper surface is roughly equal to or higher than a radius of each of
the solder balls.

14. The ball electrode forming method according to claim 8,
wherein the plurality of adjacent openings are interconnected in the
10 lower surface side.

15. The ball electrode forming method according to claim 8,
wherein the semiconductor apparatus peeled off from the wiring board
includes an electrically failed place.

16. The ball electrode forming method according to claim 8,
wherein the mask is made of a metal material.